

REMARKS/ARGUMENTS

Applicant has carefully reviewed and considered the Office Action mailed on December 19, 2006, and the references cited therewith.

Claims 1, 3, 14-15, 39, and 46 are amended, no claims are canceled or added, and claims 17-30 are withdrawn; as a result, claims 1-46 are now pending in this application.

Double Patenting Rejection

Claim 14 was rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 6, 11, and 16 of U.S. Patent No. 7,145,174.

Claim 14 was provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 6, 21, and 31 of copending Application No. 10/763,353.

Claim 14 was provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 48 of copending Application No. 10/961,507.

Claim 14 was provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 11 of copending Application No. 11/257,935.

Claims 1, 14, 36, and 39 were provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 11 and 13 of copending Application No. 10/799,838.

Claim 14 was provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 10 and 21 of copending Application No. 10/799,318.

Claim 14 was provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 2 of copending Application No. 10/799,839.

Claim 14 was provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 3, 19 and 57 of copending Application No. 10/799,961.

Claim 14 was provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 3 and 53 of copending Application 11/043,647.

Applicant's independent claim 14, as currently amended, presently recites:

means for controlling current flow electrically coupled to the drain electrode and the source electrode, wherein the means for controlling current flow is comprised at least partially of a channel in amorphous form;

* * *

wherein the channel includes one or more compounds selected from the group of formulas including $A_xB_xO_x$, $A_xB_xC_xO_x$, and $A_xB_xC_xD_xO_x$, and wherein each A is selected from the group of Zn, Cd, each B is selected from the group of Ga, In, each C and D is selected from the group of Zn, Cd, Ga, In, each O is atomic oxygen, each x is independently a non-zero integer, and wherein each of A, B, C, and D are different.

Applicant respectfully submits that the above-identified U.S. Patent No. 7,145,174, and patent applications (Serial Nos. 10/763353, 10/961,507, 11/257,935, 10/799,838, 10/799,318, 10/799,839, 10/799,961, and 11/043,647) do not teach or suggest that "the channel includes one or more compounds selected from the group of formulas including $A_xB_xO_x$, $A_xB_xC_xO_x$, and $A_xB_xC_xD_xO_x$, and wherein each A is selected from the group of Zn, Cd, each B is selected from the group of Ga, In", as recited in independent claim 14 of the present application, as currently amended.

As such, Applicant respectfully submits that each and every element and limitation of independent claim 14, as amended, is not taught or suggested in the cited references. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the nonstatutory obviousness-type double patenting rejection of independent claim 14, as amended, as well as those claims that depend therefrom.

§ 112 Rejection of the Claims

Claims 1-13, 15, 33-35 and 39-46 were rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Within the listing of claims shown above, claims 1 and 39 were rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Applicant respectfully traverses the rejection as follows.

Applicant has amended independent claims 1 and 39 based upon the second interpretation offered by the Examiner. That is, independent claims 1 and 39, as amended, recite “the channel includes one or more metal oxides that include zinc-gallium, cadmium-gallium, cadmium-indium”. As such, Applicant respectfully requests reconsideration and withdrawal of the § 112 rejection of independent claims 1 and 39, as currently amended, as well as those claims that depend therefrom.

Within the listing of claims shown above, claims 2, 5, 7, 9, 11, 13, 41, 43, and 45 were rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Applicant respectfully traverses the rejection as follows.

Applicant respectfully notes that the specification of the present application as originally presented supports, and clarifies, claim recitations such as, for example, “wherein the metal oxide includes an atomic composition of metal (A)-to-metal (B) ratio (A:B), wherein A and B are each in a range of about 0.05 to about 0.95”, as recited in dependent claim 2. For example, the specification recites on page 7, lines 18-25:

the metal oxide can include an atomic composition of metal (A)-to-metal (B) ratio (A:B), where A and B can independently take values from about 0.05 to about 0.95. Thus, a zinc-gallium oxide can

include an atomic composition having a relative concentration of 0.05 zinc and 0.95 gallium or 0.95 zinc and 0.05 gallium. That is, the channel according to this embodiment can include various two-component oxides having an atomic composition of each component falling within the range of about 0.05 to about 0.95.

The specification also recites, "For example, if A represents the metal cation Zn, and x represents the number 2, then A_x can include Zn_2 , e.g., two atoms of Zn." (Page 6, lines 26-27).

As such, Applicant respectfully submits that the intent of claim recitations such as, for example, "wherein the metal oxide includes an atomic composition of metal (A)-to-metal (B) ratio (A:B), wherein A and B are each in a range of about 0.05 to about 0.95", as recited in dependent claim 2, will be appreciated by one of ordinary skill in the relevant art. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the § 112 rejection of claims 2, 5, 7, 9, 11, 13, 41, 43, and 45.

Within the listing of claims shown above, claims 3, 15, and 46 were rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Applicant respectfully traverses the rejection as follows.

Applicant's dependent claim 3, as currently amended, presently recites, "the metal oxides include at least one of a single-phase crystalline form, and a mixed-phase crystalline form."

Dependent claim 15, as currently amended, presently recites, "forming the channel using metal oxides at least one of an amorphous form, a single-phase crystalline form, and a mixed-phase crystalline form."

In addition, dependent claim 46, as currently amended, presently recites, "the one or more metal oxides include at least one of a single-phase crystalline form, and a mixed-phase crystalline form."

As such, Applicant respectfully submits that both issues raised by the Examiner have been resolved. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the § 112 rejection of claims 3, 15, and 46.

In addition, within the listing of claims shown above, claims 6-7, 10-11, 33-34, and 42-45 were rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Applicant respectfully traverses the rejection as follows.

Applicant respectfully notes that the specification of the present application as originally presented supports, and clarifies, “each x is independently a non-zero number”, as recited in dependent claim 6, for instance. For example, the specification recites, “In formulas, the letters, e.g., A, are intended to denote a metal cation selected from a defined group and the subscripts, e.g., x, are intended to denote the number of atoms of the metal cation selected from the defined group.” (Page 13, lines 23-25). Further, the specification also recites, “each x can be independently a non-zero integer” and that “the value of “x” for each of the constituent elements may be different”. (Page 7, lines 31-33).

As such, Applicant respectfully submits that the intent of the element “each x is independently a non-zero number” will be appreciated by one of ordinary skill in the relevant art. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the § 112 rejection of claims 6-7, 10-11, 33-34, and 42-45.

§ 102 Rejection of the Claims

Claims 14-16 were rejected under 35 USC § 102(a) as being anticipated by Yagi (U.S. Pub. No. 2003/0111663). Applicant respectfully traverses the rejection as follows.

Applicant does not admit that the Yagi reference is indeed prior art and reserves the right to swear behind at a later date. Nonetheless, Applicant believes

that the present application can be distinguished from the Yagi reference for at least the following reasons.

Applicant's independent claim 14, as currently amended, presently recites:

means for controlling current flow electrically coupled to the drain electrode and the source electrode, wherein the means for controlling current flow is comprised at least partially of a channel in amorphous form;

* * *

wherein the channel includes one or more compounds selected from the group of formulas including $A_xB_xO_x$, $A_xB_xC_xO_x$, and $A_xB_xC_xD_xO_x$, and wherein each A is selected from the group of Zn, Cd, each B is selected from the group of Ga, In, each C and D is selected from the group of Zn, Cd, Ga, In, each O is atomic oxygen, each x is independently a non-zero integer, and wherein each of A, B, C, and D are different.

From Applicant's review of the Yagi reference, the reference does not appear to teach, "the channel includes one or more compounds selected from the group of formulas including $A_xB_xO_x$, $A_xB_xC_xO_x$, and $A_xB_xC_xD_xO_x$, and wherein each A is selected from the group of Zn, Cd, each B is selected from the group of Ga, In", as recited in independent claim 14, as amended. In contrast to independent claim 14, as amended, the Yagi reference appears to teach, "a transparent semiconductor layer containing one or more elements selected from Al, Ga, In, nitrogen and hydrogen." (Paragraph 0040, lines 1-3). Applicant respectfully submits that a channel including " $A_xB_xO_x$ " where "each A is selected from the group of Zn, Cd" cannot be formed from the elements listed in the Yagi reference because zinc, cadmium, and oxygen are not included in the reference.

As such, Applicant respectfully submits that each and every element and limitation of independent claim 14, as amended, is not taught in the Yagi reference. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the § 102 rejection of independent claim 14, as amended, as well as those claims that depend therefrom.

Claims 14 and 15 were rejected under 35 USC § 102(b) as being anticipated by Noguchi (U.S. Patent No. 5,289,016). Applicant respectfully traverses the rejection as follows.

As presented above, Applicant's independent claim 14, as currently amended, presently recites:

means for controlling current flow electrically coupled to the drain electrode and the source electrode, wherein the means for controlling current flow is comprised at least partially of a channel in amorphous form;

* * *

wherein the channel includes one or more compounds selected from the group of formulas including $A_xB_xO_x$, $A_xB_xC_xO_x$, and $A_xB_xC_xD_xO_x$, and wherein each A is selected from the group of Zn, Cd, each B is selected from the group of Ga, In, each C and D is selected from the group of Zn, Cd, Ga, In, each O is atomic oxygen, each x is independently a non-zero integer, and wherein each of A, B, C, and D are different.

From Applicant's review of the Noguchi reference, the reference does not appear to teach, "the channel includes one or more compounds selected from the group of formulas including $A_xB_xO_x$, $A_xB_xC_xO_x$, and $A_xB_xC_xD_xO_x$, and wherein each A is selected from the group of Zn, Cd, each B is selected from the group of Ga, In", as recited in independent claim 14, as amended. In contrast to independent claim 14, as amended, the Noguchi reference appears to teach, "A nondoped amorphous silicon film". (Col. 3, line 11). Applicant respectfully submits that a channel including " $A_xB_xO_x$ " cannot be formed from a nondoped amorphous silicon film.

As such, Applicant respectfully submits that each and every element and limitation of independent claim 14, as amended, is not taught in the Noguchi reference. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the § 102 rejection of independent claim 14, as amended, as well as those claims that depend therefrom.

Claims 14-16, 31 and 32 were rejected under 35 USC § 102(e) as being anticipated by Hoffman et al. (U.S. Pub. No. 2005/0017244). Applicant respectfully traverses the rejection as follows.

As presented above, Applicant's independent claim 14, as currently amended, presently recites:

means for controlling current flow electrically coupled to the drain electrode and the source electrode, wherein the means for controlling current flow is comprised at least partially of a channel in amorphous form;

* * *

wherein the channel includes one or more compounds selected from the group of formulas including $A_xB_xO_x$, $A_xB_xC_xO_x$, and $A_xB_xC_xD_xO_x$, and wherein each A is selected from the group of Zn, Cd, each B is selected from the group of Ga, In, each C and D is selected from the group of Zn, Cd, Ga, In, each O is atomic oxygen, each x is independently a non-zero integer, and wherein each of A, B, C, and D are different.

Additionally, Applicant's independent claim 31, as previously presented, recites:

providing a precursor composition that includes one or more precursor compounds that include: zinc oxide, cadmium oxide, gallium oxide, indium oxide, zinc-gallium oxide, cadmium-gallium oxide, and cadmium-indium oxide;

From Applicant's review of the cited Hoffman reference, the reference does not appear to teach, "the channel includes one or more compounds selected from the group of formulas including $A_xB_xO_x$ " where "each A is selected from the group of Zn, Cd, each B is selected from the group of Ga, In", as recited in independent claim 14, as amended. Nor does the reference teach "one or more precursor compounds that include: zinc oxide, cadmium oxide, gallium oxide, indium oxide, zinc-gallium oxide, cadmium-gallium oxide, and cadmium-indium oxide", as recited in independent claim 31, as previously presented.

In contrast to independent claims 14 and 31, the cited Hoffman reference appears to teach, "The channel is comprised of a ternary compound containing zinc, tin, and oxygen". (Abstract). Applicant respectfully submits that a channel

including " $A_xB_xO_x$ " where "each A is selected from the group of Zn, Cd, each B is selected from the group of Ga, In" cannot be formed from the elements listed in the cited Hoffman reference because cadmium, gallium, and indium are not included in the cited reference. In addition, the cited Hoffman reference includes tin as a component of the ternary compound, whereas the present application does not recite tin as a possible element included in $A_xB_xO_x$.

As such, Applicant respectfully submits that each and every element and limitation of independent claims 14 and 31 is not taught in the cited Hoffman reference. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the § 102 rejection of independent claim 14, as amended, and independent claim 31, as previously presented, as well as those claims that depend therefrom.

Claims 1-5, 14-16, 31-32, 36-41 and 46 were rejected under 35 USC § 102(b) as being anticipated by Cillessen et al (U.S. Patent No. 5,744,864). Applicant respectfully traverses the rejection as follows.

With regard to independent claims 1, 14, 31, 36, and 39, the Examiner appears to take Official Notice by stating that "it is inherent that the $ZnGa_2O_4$ or $CdGa_2O_4$ film is amorphous when deposited by vapor deposition (i.e., sputtering) as disclosed by Cillessen". MPEP section 2144.03 states:

It would not be appropriate for the examiner to take official notice of facts without citing a prior art reference where the facts asserted to be well known are not capable of instant and unquestionable demonstration as being well-known. For example, assertions of technical facts in the areas of esoteric technology or specific knowledge of the prior art must always be supported by citation to some reference work recognized as a standard in the pertinent art.

Applicant respectfully submits that a "channel", as recited in independent claims 1, 14, 31, 36, and 39, comprising metal oxides is difficult to prepare in an amorphous form and, therefore, is not commonly done. As such, Applicant respectfully submits that utilizing in a channel one or more metal oxides in

amorphous form is “not capable of instant and unquestionable demonstration as being well-known.”

Accordingly, Applicant respectfully requests a “citation to some reference work recognized as a standard in the pertinent art” that supports stating that “it is inherent that the ZnGa_2O_4 or CdGa_2O_4 film is amorphous when deposited by vapor deposition (i.e., sputtering)”. Moreover, Applicant respectfully notes that the limitation “deposited by vapor deposition (i.e., sputtering)” is not present in independent claims 1, 14, 31, 36, and 39.

As stated in Applicant’s previous response, the Cillessen reference appears to teach, “The semiconductor material is a degenerate semiconductor material” that is “provided with dopant atoms”. (Abstract). However, from Applicant’s review of Cillessen, the reference does not appear to teach a channel contacting the drain electrode and the source electrode, wherein the channel includes one or more metal oxides that include zinc-gallium, cadmium-gallium, cadmium-indium, and where at least one metal oxide of the channel is of an amorphous form.

In contrast, Applicant’s independent claim 1, as amended, recites:

a channel contacting the drain electrode and the source electrode, wherein the channel includes one or more metal oxides that include zinc-gallium, cadmium-gallium, cadmium-indium, and wherein at least one metal oxide of the channel is of an amorphous form;

Independent claim 14, as amended, recites:

means for controlling current flow electrically coupled to the drain electrode and the source electrode, wherein the means for controlling current flow is comprised at least partially of a channel in amorphous form;

Independent claim 31, as previously presented, recites:

depositing a channel including the precursor composition to form a multicomponent oxide from the precursor composition contacting the drain electrode and the source electrode, wherein the multicomponent oxide is of an amorphous form;

Independent claim 36, as previously presented, recites:

providing a semiconductor device that includes a source electrode, a drain electrode, and a channel to electrically couple the source electrode and the drain electrode, a gate electrode separated from the channel by a gate dielectric, wherein the channel includes a multicomponent oxide including at least one metal cation from group 12, and at least one metal cation from group 13, wherein group 12 cations includes Zn and Cd, and group 13 cations includes Ga and In, to form at least one of a three-component oxide, a four-component oxide, and a two-component oxide that includes zinc-gallium oxide, cadmium-gallium oxide, cadmium-indium oxide, wherein at least one of the two-, three-, and four-component oxides is formed of an amorphous form;

In addition, independent claim 39, as amended, recites:

a channel contacting the drain electrode and the source electrode, wherein the channel includes one or more metal oxides that include zinc-gallium, cadmium-gallium, cadmium-indium, and wherein at least one metal oxide of the channel is of an amorphous form;

As such, Applicant respectfully submits that each and every element and limitation of independent claims 1, 14, 31, 36, and 39 is not taught in the Cillessen reference. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the § 102 rejection of independent claims 1, 14, 31, 36, and 39, as well as those claims that depend therefrom.

Moreover, with regard to independent claim 31, as previously presented, the Examiner apparently takes Official Notice by stating, "If the product of a product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966."

Applicant respectfully submits that the Cillessen reference does not disclose "wherein the multicomponent oxide is of an amorphous form", as recited in part in independent claim 31, as previously presented. Accordingly, the Official Notice taken by the Examiner does not cure the deficiencies of the Cillessen reference.

As such, the final product of independent claim 31, as previously presented, is not the same as a product of the prior art, in particular, that of Cillessen. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection of independent claim 31, as previously presented, premised upon the *In re Thorpe* decision, as well as those claims that depend therefrom.



CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicants' attorney Gregg W. Wisdom at (360) 212-8052 to facilitate prosecution of this matter.

At any time during the pendency of this application, please charge any additional fees or credit overpayment to the Deposit Account No. 08-2025.

CERTIFICATE UNDER 37 CFR §1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: **MS AMENDMENT** Commissioner for Patents, P.O. BOX 1450, Alexandria, VA 22313-1450 on this 15th day of March, 2007.

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